

---

VOLUME 143 NUMBER 4



APRIL 2015

WHOLE NUMBER 670

---

# PROCEEDINGS

OF THE

---

A M E R I C A N M A T H E M A T I C A L S O C I E T Y

---

**EDITED BY**

Lev Borisov

Kathrin Bringmann

Harm Derksen

Mirna Džamonja

Franc Forstneric

Pamela B. Gorkin

Patricia L. Hersh

Michael Hitrik

Adrian Ioana

Alexander Iosevich

Joachim Krieger

David Levin

Michael A. Mandell

Varghese Mathai

Svitlana Mayboroda

Mark M. Meerschaert

Kailash C. Misra

Lei Ni

Ken Ono, Managing Editor

Matthew A. Papanikolas

Irena Peeva

Martin Scharlemann

Thomas Schlumprecht

Nimish Shah

Romyar T. Sharifi

Mei-Chi Shaw

Catherine Sulem

Sergei K. Suslov

Pham Huu Tiep

Jeremy Tyson

Walter Van Assche

Guofang Wei

Kevin Whyte

Michael Wolf

Yingfei Yi

---

PROVIDENCE, RHODE ISLAND USA

ISSN 0002-9939 (print)

ISSN 1088-6826 (online)

*Available electronically at*  
**[www.ams.org/proc/](http://www.ams.org/proc/)**

## Proceedings of the American Mathematical Society

This journal is devoted entirely to research in pure and applied mathematics.

**Submission information.** See **Information for Authors** at the end of this issue.

**Publisher Item Identifier.** The Publisher Item Identifier (PII) appears at the top of the first page of each article published in this journal. This alphanumeric string of characters uniquely identifies each article and can be used for future cataloging, searching, and electronic retrieval.

**Publication on the AMS website.** Articles are published on the AMS website individually after proof is returned from authors and before appearing in an issue.

**Subscription information.** *Proceedings of the American Mathematical Society* is published monthly and is also accessible electronically from [www.ams.org/journals/](http://www.ams.org/journals/). Subscription prices for Volume 143 (2015) are as follows: for paper delivery, US\$1489.00 list, US\$1191.20 institutional member, US\$1340.10 corporate member, US\$893.40 individual member; for electronic delivery, US\$1310.00 list, US\$1048.00 institutional member, US\$1179.00 corporate member, US\$786.00 individual member. Upon request, subscribers to paper delivery of this journal are also entitled to receive electronic delivery. If ordering the paper version, add US\$5 for delivery within the United States; US\$52 for delivery outside the United States. Subscription renewals are subject to late fees. See [www.ams.org/journal-faq](http://www.ams.org/journal-faq) for more journal subscription information.

**Back number information.** For back issues see [www.ams.org/bookstore](http://www.ams.org/bookstore).

Subscriptions and orders should be addressed to the American Mathematical Society, P.O. Box 845904, Boston, MA 02284-5904 USA. *All orders must be accompanied by payment.* Other correspondence should be addressed to 201 Charles Street, Providence, RI 02904-2294 USA.

**Copying and reprinting.** Individual readers of this publication, and nonprofit libraries acting for them, are permitted to make fair use of the material, such as to copy an article for use in teaching or research. Permission is granted to quote brief passages from this publication in reviews, provided the customary acknowledgment of the source is given.

Republication, systematic copying, or multiple reproduction of any material in this publication is permitted only under license from the American Mathematical Society. Permissions to reuse portions of AMS publication content are handled by Copyright Clearance Center's RightsLink® service. For more information, please visit <http://www.ams.org/rightslink>.

Translation rights and licensed reprint requests should be sent to [reprint-permission@ams.org](mailto:reprint-permission@ams.org).

Excluded from these provisions is material for which the author holds copyright. In such cases, requests for permission to reuse or reprint material should be addressed directly to the author(s). Copyright ownership is indicated in the notice in the lower right-hand corner of the first page of each article.

---

*Proceedings of the American Mathematical Society* (ISSN 0002-9939 (print); ISSN 1088-6826 (online)) is published monthly by the American Mathematical Society at 201 Charles Street, Providence, RI 02904-2294 USA. Periodicals postage is paid at Providence, Rhode Island. Postmaster: Send address changes to Proceedings, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA.

© 2015 by the American Mathematical Society. All rights reserved.

This journal is indexed in *Mathematical Reviews*, *Zentralblatt MATH*, *Science Citation Index*®, *Science Citation Index*<sup>TM</sup>-Expanded, *ISI Alerting Services*<sup>SM</sup>, *CompuMath Citation Index*®, and *Current Contents*®/*Physical, Chemical & Earth Sciences*. This journal is archived in *Portico* and in *CLOCKSS*.

Printed in the United States of America.

⊗ The paper used in this journal is acid-free and falls within the guidelines established to ensure permanence and durability.

10 9 8 7 6 5 4 3 2 1      20 19 18 17 16 15

PROCEEDINGS OF THE AMERICAN MATHEMATICAL SOCIETY  
CONTENTS

Vol. 143, No. 4

Whole No. 670

April 2015

A. ALGEBRA, NUMBER THEORY, AND COMBINATORICS

GilYoung Cheong, Melanie Matchett Wood, and Azeem Zaman, <a href="#">The distribution of points on superelliptic curves over finite fields</a> .....	1365
Adam James, Kay Magaard, and Sergey Shpectorov, <a href="#">The lift invariant distinguishes components of Hurwitz spaces for <math>A_5</math></a> .....	1377
M. Ram Murty and R. Thangadurai, <a href="#">On the parity of the Fourier coefficients of <math>j</math>-function</a> .....	1391
Mourad E. H. Ismail and Plamen Simeonov, <a href="#">Complex Hermite polynomials: Their combinatorics and integral operators</a> .....	1397
Dusty Grundmeier and Jennifer Halfpap Kacmarcik, <a href="#">An application of Macaulay's estimate to sums of squares problems in several complex variables</a> .....	1411
Ji-Wei He, Fred Van Oystaeyen, and Yinhuo Zhang, <a href="#">Graded 3-Calabi-Yau algebras as Ore extensions of 2-Calabi-Yau algebras</a> .....	1423
Chikashi Miyazaki, <a href="#">A cohomological criterion for splitting of vector bundles on multiprojective space</a> .....	1435
Igor E. Shparlinski, <a href="#">On the product of small Elkies primes</a> .....	1441
Kate Juschenko and Tatiana Nagnibeda, <a href="#">Small spectral radius and percolation constants on non-amenable Cayley graphs</a> .....	1449
Henry Cohn and Abhinav Kumar, <a href="#">Metacommutation of Hurwitz primes</a> ....	1459
Wadim Zudilin, <a href="#">On three theorems of Folsom, Ono and Rhoades</a> .....	1471
Uffe Haagerup and Søren Knudby, <a href="#">A Lévy-Khinchin formula for free groups</a> .....	1477
Khoa D. Nguyen, <a href="#">Algebraic independence of local conjugacies and related questions in polynomial dynamics</a> .....	1491

B. ANALYSIS

J. Hounie and T. Picon, <a href="#">Local <math>L^1</math> estimates for elliptic systems of complex vector fields</a> .....	1501
Mirza Karamehmedović, <a href="#">On analytic continuability of the missing Cauchy datum for Helmholtz boundary problems</a> .....	1515
Dragomir Šarić, <a href="#">Earthquakes in the length-spectrum Teichmüller spaces</a> .....	1531
Sergii Kolyada and Julia Semikina, <a href="#">On topological entropy: When positivity implies +infinity</a> .....	1545
W. B. Johnson and S. Ortega Castillo, <a href="#">The cluster value problem in spaces of continuous functions</a> .....	1559
Atsushi Yamamori, <a href="#">A generalization of the Forelli-Rudin construction and deflation identities</a> .....	1569
Florin Diacu and Brendan Thorn, <a href="#">Rectangular orbits of the curved 4-body problem</a> .....	1583
Philip T. Gressman, <a href="#"><math>L^p</math>-nondegenerate Radon-like operators with vanishing rotational curvature</a> .....	1595
Nam Q. Le and Ovidiu Savin, <a href="#">On boundary Hölder gradient estimates for solutions to the linearized Monge-Ampère equations</a> .....	1605
Gustaf Gripenberg, <a href="#">On the definition of the cone spectral radius</a> .....	1617
Leandro Arosio, Filippo Bracci, and Erlend Fornæss Wold, <a href="#">Embedding univalent functions in filtering Loewner chains in higher dimension</a> .....	1627

<b>Fritz Gesztesy, Marius Mitrea, Roger Nichols, and El Maati Ouhabaz,</b> Heat kernel bounds for elliptic partial differential operators in divergence form with Robin-type boundary conditions II .....	1635
<b>Jinhua Fan and Yunping Jiang,</b> Angle geometry in the universal Teichmüller space .....	1651
<b>Ihyeok Seo,</b> Unique continuation for fractional Schrödinger operators in three and higher dimensions .....	1661
<b>Dongyang Chen, Ju Myung Kim, and Bentuo Zheng,</b> The weak bounded approximation property of pairs .....	1665
<b>Marek Jarnicki and Peter Pflug,</b> A counterexample to a theorem of Bremermann on Shilov boundaries .....	1675

#### D. GEOMETRY

<b>Doowon Koh and Hae-Sang Sun,</b> Distance sets of two subsets of vector spaces over finite fields .....	1679
<b>Shiri Artstein-Avidan and Boaz A. Slomka,</b> A note on Santaló inequality for the polarity transform and its reverse .....	1693
<b>Jaegil Kim and Artem Zvavitch,</b> Stability of the reverse Blaschke-Santaló inequality for unconditional convex bodies .....	1705
<b>Glen Wheeler,</b> Gap phenomena for a class of fourth-order geometric differential operators on surfaces with boundary .....	1719
<b>Benjamin Mackey,</b> $SO(2)$ -congruent projections of convex bodies with rotation about the origin .....	1739

#### E. LOGIC AND FOUNDATIONS

<b>Janusz Pawlikowski,</b> On the concept of analytic hardness .....	1745
<b>Mauro Di Nasso,</b> Iterated hyper-extensions and an idempotent ultrafilter proof of Rado's Theorem .....	1749
<b>Paul B. Larson,</b> A choice function on countable sets, from determinacy .....	1763
<b>Miloš S. Kurilić,</b> Forcing with copies of countable ordinals .....	1771

#### F. STATISTICS AND PROBABILITY

<b>Bero Roos,</b> On Bobkov's approximate de Finetti representation via approximation of permanents of complex rectangular matrices .....	1785
--	------

#### G. TOPOLOGY

<b>Mainak Poddar and Soumen Sarkar,</b> A class of torus manifolds with nonconvex orbit space .....	1797
<b>Kyle Hayden and Joshua M. Sabloff,</b> Positive knots and Lagrangian fillability	1813
<b>S. S. Gabrielyan,</b> Minimally almost periodic group topologies on countably infinite Abelian groups .....	1823

## Editorial Information

To be published in the *Proceedings*, a paper must be correct, new, nontrivial, and significant. Further, it must be well written and of interest to a substantial number of mathematicians. Piecemeal results, such as an inconclusive step toward an unproved major theorem or a minor variation on a known result, are in general not acceptable for publication. *Proceedings* Editors solicit and encourage publication of worthy papers of **length not exceeding 15 published pages**. Published pages are the same size as those generated in the style files provided for  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ .

Information on the backlog for this journal can be found on the AMS website starting from <http://www.ams.org/proc>.

In an effort to make articles available as quickly as possible, articles are electronically published on the AMS website individually after proof is returned from authors and before appearing in an issue.

A Consent to Publish is required before we can begin processing your paper. After a paper is accepted for publication, the Providence office will send a Consent to Publish to all authors of the paper. By submitting a paper to this journal, authors certify that the results have not been submitted to nor are they under consideration for publication by another journal, conference proceedings, or similar publication.

## Information for Authors

**Initial submission.** All articles submitted to this journal are peer reviewed. The AMS has a single blind peer-review process in which the reviewers know who the authors of the manuscript are, but the authors do not have access to the information on who the peer reviewers are. The AMS uses Centralized Manuscript Processing for initial submission. Authors should submit a PDF file using the Initial Manuscript Submission form found at [www.ams.org/submission/proc](http://www.ams.org/submission/proc) or send one copy of the manuscript to the following address: Centralized Manuscript Processing, PROCEEDINGS OF THE AMS, 201 Charles Street, Providence, RI 02904-2294 USA. If a paper copy is being forwarded to the AMS, indicate that it is for *Proceedings* and include the name of the corresponding author, contact information such as email address or mailing address, and the name of an appropriate Editor to review the paper (see the list of Editors below).

The first page of an article must consist of a *descriptive title*, followed by an *abstract* that summarizes the article in language suitable for workers in the general field (algebra, analysis, etc.). The *descriptive title* should be short but informative; useless or vague phrases such as “some remarks about” or “concerning” should be avoided. The *abstract* should be at least one complete sentence and at most 150 words. Included with the footnotes to the paper should be the 2010 *Mathematics Subject Classification* representing the primary and secondary subjects of the article. The classifications are accessible from [www.ams.org/msc/](http://www.ams.org/msc/). The Mathematics Subject Classification footnote may be followed by a list of *key words and phrases* describing the subject matter of the article and taken from it. Journal abbreviations used in bibliographies are listed in the latest *Mathematical Reviews* annual index. The series abbreviations are also accessible from [www.ams.org/msnhtml/serials.pdf](http://www.ams.org/msnhtml/serials.pdf). To help in preparing and verifying references, the AMS offers MR Lookup, a Reference Tool for Linking, at [www.ams.org/mrlookup/](http://www.ams.org/mrlookup/).

**Electronically prepared manuscripts.** Manuscripts should be electronically prepared in  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$ . To this end, the Society has prepared  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$  author packages for each AMS publication. Author packages include instructions for preparing electronic manuscripts, samples, and a style file that generates the particular design specifications of that publication series. Articles properly prepared using the  $\mathcal{A}\mathcal{M}\mathcal{S}$ - $\mathcal{L}\mathcal{A}\mathcal{T}\mathcal{E}\mathcal{X}$  style file and the `\label` and `\ref` commands automatically enable extensive intra-document linking to the bibliography and other elements of the article for searching electronically on the Web.

Authors may retrieve an author package for *Proceedings of the AMS* from [www.ams.org/proc/procauthorpac.html](http://www.ams.org/proc/procauthorpac.html) or via FTP to [ftp.ams.org](ftp://ftp.ams.org) (login as `anonymous`, enter your complete email address as password, and type `cd pub/author-info`). The *AMS Author*

*Handbook* and the *Instruction Manual* are available in PDF format from the author package link. The author package can also be obtained free of charge by sending email to [tech-support@ams.org](mailto:tech-support@ams.org) or from the Publication Division, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. When requesting an author package, please specify the publication in which your paper will appear. Please be sure to include your complete email address.

**After acceptance.** The source files for the final version of the electronic manuscript should be sent to the Providence office immediately after the paper has been accepted for publication. The author should also submit a PDF of the final version of the paper to the Editor, who will forward a copy to the Providence office. Accepted electronically prepared manuscripts can be submitted via the Web at [www.ams.org/submit-book-journal/](http://www.ams.org/submit-book-journal/), sent via email to [pub-submit@ams.org](mailto:pub-submit@ams.org), or sent on CD to the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA. When sending a manuscript electronically via email or CD, please be sure to include a message indicating in which publication the paper has been accepted. Complete instructions on how to send files are included in the author package.

**Electronic graphics.** Comprehensive instructions on preparing graphics are available starting from [www.ams.org/authors/journals.html](http://www.ams.org/authors/journals.html). A few of the major requirements are given here.

Submit files for graphics as EPS (Encapsulated PostScript) files. This includes graphics originated via a graphics application as well as scanned photographs or other computer-generated images. If this is not possible, TIFF files are acceptable as long as they can be opened in Adobe Photoshop or Illustrator.

Authors using graphics packages for the creation of electronic art should also avoid the use of any lines thinner than 0.5 points in width. Many graphics packages allow the user to specify a “hairline” for a very thin line. Hairlines often look acceptable when proofed on a typical laser printer. However, when produced on a high-resolution laser imagesetter, hairlines become nearly invisible and will be lost entirely in the final printing process.

Screens should be set to values between 15% and 85%. Screens which fall outside of this range are too light or too dark to print correctly. Variations of screens within a graphic should be no less than 10%.

Any graphics created in color will be rendered in grayscale for the printed version unless color printing is authorized by the Managing Editor and the Publisher. In general, color graphics will appear in color in the online version.

**AMS policy on making changes to articles after publication.** Articles are published on the AMS website individually after proof is returned from authors and before appearing in an issue. To preserve the integrity of electronically published articles, once an article is individually published to the AMS website, changes cannot be made in place in the paper. The AMS does not keep author-related information such as affiliation, current address, and email address up to date after a paper is electronically published.

Corrections of critical errors may be made to the paper by submitting an errata article to the Editor. The errata article will be published electronically, will appear in a future print issue, and will link back and forth on the Web with the original article.

**Secure manuscript tracking on the Web.** Authors can track their manuscripts through the AMS journal production process using the personal AMS ID and Article ID printed in the upper right-hand corner of the Consent to Publish form sent to each author who publishes in AMS journals. Access to the tracking system is available from [www.ams.org/mstrack/](http://www.ams.org/mstrack/). An explanation of each production step is provided on the Web through links from the manuscript tracking screen. Questions can be sent to [proc-query@ams.org](mailto:proc-query@ams.org).

**Inquiries.** Any inquiries concerning a paper that has been accepted for publication that cannot be answered via the manuscript tracking system mentioned above should be sent to [proc-query@ams.org](mailto:proc-query@ams.org) or directly to the Electronic Prepress Department, American Mathematical Society, 201 Charles Street, Providence, RI 02904-2294 USA.

## Editors

The AMS uses Centralized Manuscript Processing for initial submissions to AMS journals. Authors should follow instructions listed on the Initial Submission page found at [www.ams.org/proc/procsubmit.html](http://www.ams.org/proc/procsubmit.html).

Managing Editor: Ken Ono, Emory University, Atlanta, GA 30322 USA; e-mail: [ono@mathcs.emory.edu](mailto:ono@mathcs.emory.edu)

### 1. ODE, PDE, GLOBAL ANALYSIS, AND DYNAMICAL SYSTEMS

Coordinating Editor: Nimish Shah, The Ohio State University, 231 West 18th Avenue, Columbus, OH 43210 USA; e-mail: [shah@math.osu.edu](mailto:shah@math.osu.edu)

**Ergodic theory and dynamical systems**, Nimish Shah

**Global analysis**, Guofang Wei, University of California, Santa Barbara, 552 University Road, Santa Barbara, CA 93106-3080 USA; e-mail: [wei@math.ucsb.edu](mailto:wei@math.ucsb.edu)

**Global analysis, noncommutative geometry, and the mathematics of string theory**, Varghese Mathai, School of Mathematical Sciences, The University of Adelaide, SA 5005, Australia; e-mail: [mathai.varghese@adelaide.edu.au](mailto:mathai.varghese@adelaide.edu.au)

**Ordinary differential equations and dynamical systems**, Yingfei Yi, School of Mathematics, Georgia Institute of Technology, Atlanta, GA 30332-0001 USA; e-mail: [yi@math.gatech.edu](mailto:yi@math.gatech.edu)

**Partial differential equations**, Joachim Krieger, École Polytechnique Fédérale de Lausanne Bâtiment des Mathématiques Station 8, CH-1015 Lausanne, Switzerland; e-mail: [joachim.krieger@epfl.ch](mailto:joachim.krieger@epfl.ch)

### 2. TOPOLOGY AND GEOMETRY

Coordinating Editor: Michael Wolf, Rice University, P. O. Box 1892, MS 136, Houston, TX 77005-1892 USA; e-mail: [mwolf@rice.edu](mailto:mwolf@rice.edu)

**Algebraic topology**, Michael A. Mandell, Indiana University Bloomington, 831 E. Third Street, Bloomington, IN 47405 USA; e-mail: [mmandell@indiana.edu](mailto:mmandell@indiana.edu)

**Differential geometry**, Lei Ni, University of California, San Diego, La Jolla, CA 92093 USA; e-mail: [lني@math.ucsd.edu](mailto:lني@math.ucsd.edu); [lني.math.ucsd@gmail.com](mailto:lني.math.ucsd@gmail.com)

**Geometric analysis**, Michael Wolf

**Geometric topology**, Kevin Whyte, University of Illinois at Chicago, 851 S. Morgan Street, Chicago, IL 60607-7045 USA; e-mail: [kwhyte@math.uic.edu](mailto:kwhyte@math.uic.edu)

**Topology of manifolds and knot theory**, Martin Scharlemann, University of California, Santa Barbara, 552 University Road, Santa Barbara, CA 93106-3080 USA; e-mail: [mgscharl@math.ucsb.edu](mailto:mgscharl@math.ucsb.edu)

### 3. ANALYSIS

Coordinating Editor: Mei-Chi Shaw, University of Notre Dame, Notre Dame, IN 46556-0398 USA; e-mail: [mei-chi.shaw.1@nd.edu](mailto:mei-chi.shaw.1@nd.edu)

**Banach spaces and linear functional analysis**, Thomas Schlumprecht, Texas A&M University, 3368 TAMU, College Station, TX 77843-3368 USA; e-mail: [schlump@math.tamu.edu](mailto:schlump@math.tamu.edu)

**Geometric function theory**, Jeremy Tyson, University of Illinois, 1409 W. Green Street, Urbana, IL 61801 USA; e-mail: [tyson@math.uiuc.edu](mailto:tyson@math.uiuc.edu)

**Harmonic analysis**, Alexander Iosevich, University of Rochester, Rochester, NY 14627 USA; e-mail: [iosevich@math.rochester.edu](mailto:iosevich@math.rochester.edu)

**Harmonic analysis and linear partial differential equations; geometric measure theory and its applications**, Svitlana Mayboroda, Department of Mathematics, University of Minnesota, Minneapolis, MN 55455 USA; e-mail: [svitlana@math.umn.edu](mailto:svitlana@math.umn.edu)

**Microlocal analysis and spectral theory**, Michael Hitrik, University of California, Los Angeles, Los Angeles, CA 90095-1555 USA; e-mail: [hitrik@math.ucla.edu](mailto:hitrik@math.ucla.edu)

**Operator algebras**, Adrian Ioana, Department of Mathematics, University of California, San Diego, La Jolla, CA 92093 USA; e-mail: [aioana@math.ucsd.edu](mailto:aioana@math.ucsd.edu)

**Operator theory and spaces of holomorphic functions**, Pamela B. Gorkin, Bucknell University, Lewisburg, PA 17837 USA; e-mail: [pgorkin@bucknell.edu](mailto:pgorkin@bucknell.edu)

**Several complex variables**, Franc Forstneric, University of Ljubljana, Jadranska 19, 1000 Ljubljana, Slovenia; e-mail: [franc.forstneric@fmf.uni-lj.si](mailto:franc.forstneric@fmf.uni-lj.si)

#### 4. ALGEBRA, NUMBER THEORY, COMBINATORICS, AND LOGIC

Coordinating Editor: Pham Huu Tiep, University of Arizona, 617 N. Santa Rita Avenue, Tucson, AZ 85721-0089 USA; e-mail: [tiep@math.arizona.edu](mailto:tiep@math.arizona.edu)

**Algebraic and arithmetic geometry**, Lev Borisov, Rutgers University, Piscataway, NJ 08854 USA; e-mail: [borisov@math.rutgers.edu](mailto:borisov@math.rutgers.edu)

**Algebraic number theory and arithmetic geometry**, Romyar T. Sharifi, University of Arizona, 617 N. Santa Rita Avenue, Tucson, AZ 85721-0089 USA; e-mail: [sharifi@math.arizona.edu](mailto:sharifi@math.arizona.edu)

**Automorphic and modular forms**, Kathrin Bringmann, Mathematisches Institut der Universität zu Koeln, Weyertal 86-90, D-50931 Koeln, Germany; e-mail: [kbringma@math.uni-koeln.de](mailto:kbringma@math.uni-koeln.de)

**Combinatorics**, Patricia L. Hersh, North Carolina State University, Box 8205, Raleigh, NC 27695-8205 USA; e-mail: [plhersh@ncsu.edu](mailto:plhersh@ncsu.edu)

**Commutative algebra**, Irena Peeva, Cornell University, 212 Garden Avenue, Ithaca, NY 14853 USA; e-mail: [irena@math.cornell.edu](mailto:irena@math.cornell.edu)

**Group theory**, Pham Huu Tiep

**Lie algebras and quantized enveloping algebras**, Kailash C. Misra, North Carolina State University, Box 8205, Raleigh, NC 27695-8205 USA; e-mail: [misra@math.ncsu.edu](mailto:misra@math.ncsu.edu)

**Logic and foundations**, Mirna Džamonja, School of Mathematics, University of East Anglia, Norwich NR4 7TJ, United Kingdom; e-mail: [h020@uea.ac.uk](mailto:h020@uea.ac.uk)

**Noncommutative algebra and invariant theory**, Harm Derksen, University of Michigan, 530 Church Street, Ann Arbor, MI 48109-1043 USA; e-mail: [hderksen@umich.edu](mailto:hderksen@umich.edu)

**Number theory**, Matthew A. Papanikolas, Texas A&M University, 3368 TAMU, College Station, TX 77843-3368 USA; e-mail: [map@math.tamu.edu](mailto:map@math.tamu.edu)

#### 5. APPLIED MATHEMATICS, PROBABILITY, AND STATISTICS

Coordinating Editor: Mark M. Meerschaert, Department of Probability and Statistics, Michigan State University, East Lansing, MI 48823 USA; e-mail: [mcubed@stt.msu.edu](mailto:mcubed@stt.msu.edu)

**Applied probability and statistics**, David Levin, University of Oregon, Eugene, OR 97403-1221 USA; e-mail: [dlevin@uoregon.edu](mailto:dlevin@uoregon.edu)

**Integrable systems and special functions**, Sergei K. Suslov, School of Mathematical and Statistical Sciences, Arizona State University, Tempe, AZ 85287-1807 USA; e-mail: [suslov@math.la.asu.edu](mailto:suslov@math.la.asu.edu)

**Nonlinear partial differential equations**, Catherine Sulem, University of Toronto, 40 St. George Street, Bahen Center, Toronto, ON, Canada M5S 2E4; e-mail: [sulem@math.toronto.edu](mailto:sulem@math.toronto.edu)

**Probability**, Mark M. Meerschaert

**Special functions and approximation theory**, Walter Van Assche, Katholieke Universiteit Leuven, Celestijnenlaan 200B, Box 2400, BE-3001 Leuven, Belgium; e-mail: [walter.vanassche@wis.kuleuven.be](mailto:walter.vanassche@wis.kuleuven.be)



(Continued from back cover)

<b>Nam Q. Le and Ovidiu Savin</b> , On boundary Hölder gradient estimates for solutions to the linearized Monge-Ampère equations .....	1605
<b>Gustaf Gripenberg</b> , On the definition of the cone spectral radius .....	1617
<b>Leandro Arosio, Filippo Bracci, and Erlend Fornæss Wold</b> , Embedding univalent functions in filtering Loewner chains in higher dimension .....	1627
<b>Fritz Gesztesy, Marius Mitrea, Roger Nichols, and El Maati Ouhabaz</b> , Heat kernel bounds for elliptic partial differential operators in divergence form with Robin-type boundary conditions II .....	1635
<b>Jinhua Fan and Yunping Jiang</b> , Angle geometry in the universal Teichmüller space .....	1651
<b>Ihyeok Seo</b> , Unique continuation for fractional Schrödinger operators in three and higher dimensions .....	1661
<b>Dongyang Chen, Ju Myung Kim, and Bentuo Zheng</b> , The weak bounded approximation property of pairs .....	1665
<b>Marek Jarnicki and Peter Pflug</b> , A counterexample to a theorem of Bremermann on Shilov boundaries .....	1675

#### D. GEOMETRY

<b>Doowon Koh and Hae-Sang Sun</b> , Distance sets of two subsets of vector spaces over finite fields .....	1679
<b>Shiri Artstein-Avidan and Boaz A. Slomka</b> , A note on Santaló inequality for the polarity transform and its reverse .....	1693
<b>Jaegil Kim and Artem Zvavitch</b> , Stability of the reverse Blaschke-Santaló inequality for unconditional convex bodies .....	1705
<b>Glen Wheeler</b> , Gap phenomena for a class of fourth-order geometric differential operators on surfaces with boundary .....	1719
<b>Benjamin Mackey</b> , $SO(2)$ -congruent projections of convex bodies with rotation about the origin .....	1739

#### E. LOGIC AND FOUNDATIONS

<b>Janusz Pawlikowski</b> , On the concept of analytic hardness .....	1745
<b>Mauro Di Nasso</b> , Iterated hyper-extensions and an idempotent ultrafilter proof of Rado's Theorem .....	1749
<b>Paul B. Larson</b> , A choice function on countable sets, from determinacy .....	1763
<b>Miloš S. Kurilić</b> , Forcing with copies of countable ordinals .....	1771

#### F. STATISTICS AND PROBABILITY

<b>Bero Roos</b> , On Bobkov's approximate de Finetti representation via approximation of permanents of complex rectangular matrices .....	1785
--	------

#### G. TOPOLOGY

<b>Mainak Poddar and Soumen Sarkar</b> , A class of torus manifolds with nonconvex orbit space .....	1797
<b>Kyle Hayden and Joshua M. Sabloff</b> , Positive knots and Lagrangian fillability .....	1813
<b>S. S. Gabrielyan</b> , Minimally almost periodic group topologies on countably infinite Abelian groups .....	1823

PROCEEDINGS OF THE AMERICAN MATHEMATICAL SOCIETY  
 CONTENTS

Vol. 143, No. 4

Whole No. 670

April 2015

A. ALGEBRA, NUMBER THEORY, AND COMBINATORICS

GilYoung Cheong, Melanie Matchett Wood, and Azeem Zaman, *The distribution of points on superelliptic curves over finite fields* ..... 1365

Adam James, Kay Magaard, and Sergey Shpectorov, *The lift invariant distinguishes components of Hurwitz spaces for  $A_5$*  ..... 1377

M. Ram Murty and R. Thangadurai, *On the parity of the Fourier coefficients of  $j$ -function* ..... 1391

Mourad E. H. Ismail and Plamen Simeonov, *Complex Hermite polynomials: Their combinatorics and integral operators* ..... 1397

Dusty Grundmeier and Jennifer Halfpap Kacmarcik, *An application of Macaulay's estimate to sums of squares problems in several complex variables* 1411

Ji-Wei He, Fred Van Oystaeyen, and Yinhuo Zhang, *Graded 3-Calabi-Yau algebras as Ore extensions of 2-Calabi-Yau algebras* ..... 1423

Chikashi Miyazaki, *A cohomological criterion for splitting of vector bundles on multiprojective space* ..... 1435

Igor E. Shparlinski, *On the product of small Elkies primes* ..... 1441

Kate Juschenko and Tatiana Nagnibeda, *Small spectral radius and percolation constants on non-amenable Cayley graphs* ..... 1449

Henry Cohn and Abhinav Kumar, *Metacommutation of Hurwitz primes* .... 1459

Wadim Zudilin, *On three theorems of Folsom, Ono and Rhoades* ..... 1471

Uffe Haagerup and Søren Knudby, *A Lévy-Khinchin formula for free groups* 1477

Khoa D. Nguyen, *Algebraic independence of local conjugacies and related questions in polynomial dynamics* ..... 1491

B. ANALYSIS

J. Hounie and T. Picon, *Local  $L^1$  estimates for elliptic systems of complex vector fields* ..... 1501

Mirza Karamehmedović, *On analytic continuability of the missing Cauchy datum for Helmholtz boundary problems* ..... 1515

Dragomir Šarić, *Earthquakes in the length-spectrum Teichmüller spaces* ..... 1531

Sergii Kolyada and Julia Semikina, *On topological entropy: When positivity implies +infinity* ..... 1545

W. B. Johnson and S. Ortega Castillo, *The cluster value problem in spaces of continuous functions* ..... 1559

Atsushi Yamamori, *A generalization of the Forelli-Rudin construction and deflation identities* ..... 1569

Florin Diacu and Brendan Thorn, *Rectangular orbits of the curved 4-body problem* ..... 1583

Philip T. Gressman,  *$L^p$ -nondegenerate Radon-like operators with vanishing rotational curvature* ..... 1595

(Continued on inside back cover)



0002-9939(201504)143:4;1-K